AMERICAN STANDARD PRACTICE FOR ROCK-DUSTING UNDERGROUND BITUMINOUS-COAL AND LIGNITE MINES TO PREVENT COAL-DUST EXPLOSIONS (ASA STANDARD M13.1 - 1960, UDC 622.81)

Sponsored by Bureau of Mines

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FOREWORD

The effectiveness of rock-dusting for preventing coal and lignite dust explosions in mines is attested by research and by experience in operating mines. To achieve full benefits, rock dust must be applied properly and be maintained satisfactorily. This publication contains recommended practices for the use of rock dust and definitions of the terms employed.

The present American Standard Practice for Rock-Dusting Underground Bituminous-Coal and Lignite Mines to Prevent Coal-Dust Explosions is a revision of the former American Recommended Practice for Rock-Dusting Coal Mines to Prevent Coal-Dust Explosions, M13, which was approved December 30, 1925, and was reaffirmed on May 20, 1942.

The text of the earlier edition of this standard, which was sponsored by the American Institute of Mining and Metallurgical Engineers, was revised in consideration of current mining methods and their high degree of mechanization.

The Federal Bureau of Mines is sponsor of the project under which the present standard was developed. This revised standard (M13.1-1960) was approved by the American Standards Association September 13, 1960.

Marling J. Ankeny, Director

The A.S.A. Sectional Committee M 13, Rock-Dusting Coal Mines to Prevent Coal-Dust Explosions, included:

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SECTION 1. DEFINITIONS OF TERMS

1.1 Bituminous-Coal and Lignite Dust. - Carboniferous material having a volatile ratio of 12 percent or more by weight and a fineness such that the material passes through a No. 20 sieve.

1.2 Active Underground Workings. - Underground places in which men are required to be or to pass through in the performance of normal mining operations for the production of coal.

1.3 Working Areas. - Underground areas where bituminous coal and lignite are mined, specifically:

(a) Face. - The solid surface of the unbroken portion of the coalbed at the advancing end of the working place.

(b) Face Area. - The working area inby the last open crosscut in an entry or a room, including the pillar being extracted or longwall being mined.

(c) Room. - A place abutting an entry or airway where coal has been mined and extending from the entry or airway to a face.

(d) Crosscut (Breakthrough). - Passageways or openings cut through a pillar to connect adjacent entries or rooms.

1.4 Entry. - Underground haulageways, travelways, and airways, except working areas as defined in section 1.3.

(a) Active Entry. - An entry in which coal is being mined from a portion thereof or from connected sections.

(b) Parallel Entry. - Usually an intake airway parallel to the haulageway.

(c) Back Entry. - Usually a return airway parallel to the haulageway.

1.5 Rock Dust. - Pulverized inert material such as limestone, marble, dolomite, anhydrite, shale and adobe, preferably light-colored.

(a) 100 percent of which will pass through a U. S. No. 20 sieve, and 70 percent or more of which will pass through a U. S. No. 200 sieve,

(b) the particles of which when wetted and dried will not cohere to form a caked dust, and

(c) does not contain more than 5 percent of combustible matter or more than a total of 5 percent of free and combined silica (SiO_2). Limestone and similar carbonates produce the best rock dust, as this dust has low silica content, little tendency to cake, and a light color that aids illumination.

1.6 Caked Dust. - Compaction or adherence of dust particles to the extent that a light stroke with a brush or a light airblast, as from the mouth, will not cause the dust to be dispersed. A suggested laboratory test for evaluating the caking tendency of dust is appended.

1.7 Too Wet. - The term "too wet" shall mean material wet enough to exude water if a ball of the finely divided material is squeezed in the hands.

SECTION 2. PURPOSE AND EXTENT OF ROCK-DUSTING IN MINES

2.1 Rock dust shall be used in mines to neutralize the explosion hazard of bituminous-coal and lignite dust.

2.2 All underground bituminous-coal and lignite mines, except those mines or areas of mines in which the coal dust is too wet or too high in incombustible content to propagate an explosion, shall be rock-dusted to within 40 feet of all faces, and if open crosscuts near such faces are less than 40 feet therefrom, such crosscuts shall be rock-dusted.

2.3 In mines partially rock-dusted or in mines that are required to start rock-dusting, haulageways and parallel entries connected thereto by open crosscuts shall be rock-dusted. Back entries shall be rock-dusted for at least 1,000 feet outby the junction with the first active entry in each working section. Inby this junction, the rooms, entries, and crosscuts shall be rock-dusted.

SECTION 3. APPLICATION OF DRY ROCK DUST

3.1 Where dry rock dust is applied, it shall be distributed upon the top, floor, and sides of all open places and maintained in such quantity that the incombustible content of the combined coal dust, rock dust, and other dust, will not be less than 65 percent. Where methane is present in any ventilating current, the 65 percent of incombustible content of such combined dust shall be increased 1 percent for each 0.1 percent of methane. The percentage increase of rock-dusting required applied only to:

(1) Face areas that are ventilated by the current in which the methane that necessitates the percentage increase is present, and

(2) the return airways of such current, except as limited by section 2.2. If the only ventilating current in which methane is present is a main return in a mine using a split system of ventilation, no increase of rock-dusting is required. The methane content of an air split shall be determined from an air sample taken in the immediate return of that split.

3.2 Rock-dust barriers may be used as a supplement to, but not as a substitute for, generalized rock-dusting.

SECTION 4. APPLICATION OF WETTED ROCK DUST

4.1 So long as the percentage of incombustible content specified in section 3.1 is maintained, rock dust applied wet in the following manner shall be considered as compliance with said section: The application of wet rock dust shall be limited to rib and roof surfaces in face areas, which means it shall not be used on the floor or for redusting mine surfaces outby the immediate face areas. In such applications only limestone, marble, or dolomite dust, which meets the specifications in section 1.5 shall be used; the application shall be at the rate of not less than 3 ounces (weight) of dust per square foot of surface, and shall be by a mixture of not more than 6 to 8 gallons of water with 100 pounds of dust whether by premixed slurry or by mixing at the nozzle of a hose to assure that the mixture is not too fluid and that sufficient limestone, marble, or dolomite particles will adhere to the surfaces. Wet rock-dusting of ribs and roof does not eliminate the necessity for dry rock-dusting the floor, which can be accomplished by spreading the dust with shovels or otherwise without creating undesirable dust clouds. Whether additional dry rock dust will be required after the wetted dust dries depends on certain factors such as the ready dispersibility of the rock dust after drying, and the rate of settling of fine float (coal) dust on surfaces where wetted dust was applied.

SECTION 5. SAMPLING AND INSPECTION

5.1 After a mine or any part of a mine has been rock-dusted, samples of the road, rib, roof, and timber dust shall be taken from time to time to determine if that part of the mine requires redusting under the following circumstances and procedure:

(1) Dust samples shall be gathered at least once for each 1,000 feet of mining; however, the period of time between sampling shall not exceed 2 months. Samples shall be taken at points where contamination by fresh coal dust appears to be most rapid. In multiple entries, samples shall be taken opposite each other in all entries where rock-dusting is required.

(2) Dust samples shall be taken in the following manner: A section 6 inches wide across the floor from rib to rib shall be made 1-inch deep in the loose fine material by scoop or other means--firmly compacted material should not be dug up; a 6-inch strip of dust shall be brushed from both ribs and the roof (if dust is adhering to the roof); where the entry has timber sets, dust shall be brushed from the top of one collar; and where lagging is used, a 6-inch strip of dust shall be brushed from the lagging. All the material thus gathered and which may be conveniently gathered on a canvas or oilcloth, shall be screened through a 10-mesh screen, and that passing through this screen shall be quartered until a sample of 1/4 to 1/2 pound is obtained. This sample shall then be put into a can or sack, suitably labeled, and sent to the laboratory for screening through a 20-mesh screen and weighing, to determine the approximate amount of dust, and for analysis or testing for incombustible content. The floor sample may be kept separate from the rib, roof, and timber samples, and separate determinations made, or they may all be mixed to represent a band, or perimeter, sample.

5.3 The percentage of incombustible matter in the samples shall be determined by the volumeter method outlined in U.S. Bureau of Mines Technical Paper 144 or by chemical analysis, using the method outlined in U.S. Bureau of Mines Bulletin 492.

5.4 A written record shall be entered in a book kept for that purpose in the mine office, showing the date of sampling, the location at which samples have been taken, and the results of the analyses.

APPENDIX

(Suggested laboratory test for caking tendency of rock dust)

The following is presented for information purposes only and does not comprise a portion of Standard M13.1-1960.

The caking tendency of rock dust, when wetted with water and dried, is determined as follows:

Distilled water is mixed with the rock dust until a plastic mass is formed which is molded into test pieces that are air-dried at room temperature, and tested for their crushing strength.

Six brass molds are used, each 7/8 inch in outside diameter, 1 inch long, and drilled with a tapered hole 1/2 inch in diameter at one end and 9/16 inch in diameter at the other end. The inside of the mold is wiped with an oiled cloth before a test to facilitate removal of the dried cake.

A 50-gram sample of rock dust is placed on a glass plate and water is added while mixing with a spatula until the dust is completely wetted and becomes a plastic mass. From 11 to 13 milliliters of water are required for 50-gram samples of most limestone dusts.

The mold is filled by forcing a portion of the plastic mass into the large end with a spatula until an excess has been added. Then the mold is set on the glass plate and tapped on the side several times with the handle of the spatula to eliminate void spaces. The small end is scraped level, the mold set small end down on a brass plate and the large end smoothed off. After standing a minimum of 18 hours at room temperature, the test piece is removed from the mold, and the air drying continued for 6 hours.

The crushing strength in kilograms of the test piece is measured with a compression testing machine that is equipped with a constant-speed motor arranged for reversing. The machine shall apply the load to the test specimen at a continuous rate of 20 ± 1 kilogram per minute. Test pieces are crushed between aluminum plates 2 inches square and 1/16 inch thick, mounted on the rubber faces of the crushing machine. The average of six tests is taken as the caking index. Dusts having a caking index of 6 kilograms or greater (average of six tests) should not be used for wet rock-dusting.

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